Key to the Guide Sheets

Strategy:
Strategy Name

Where to Use:
This contains a brief description of where you might use this particular strategy and under what circumstances.

Details:
This section contains a brief description of the strategy and how it may be applied to address the safety concern.

Key to Success:
This section will discuss some critical things to consider when implementing this particular strategy in order to be successful.

Issues:
This section will discuss various issues that need to be addressed during the implementation process.

Time frame:
Time frames will naturally vary based on numerous factors (agency procedures, number of stakeholders, need for additional right-of-way). The scale is meant as a general guide. One circle indicates a short time frame for implementation perhaps in as little as a few months or up to 1 year. Example short term strategies include signage improvements, signal timing changes, and sight distance improvements. Two circles indicates a medium time frame of 1-2 years. Example medium term strategies include channelization improvements, system-wide signal improvements, and minor geometric improvements. Three circles indicates a longer time frame of over 2 years. These strategies will typically require major construction or right-of-way acquisition.

Costs:
Costs will also vary considerably and are affected by local conditions. Costs are ranked as: low, moderate, moderate to high, and high. The scale is meant to reflect costs relative to the other strategies described in the category (signalized or unsignalized).

Effectiveness:
This section will discuss any research or evaluations that have been done to ascertain the effectiveness of the particular strategy. Three descriptors are used to identify to what degree the strategy has been evaluated:

Proven: Those strategies that have been used in one or more locations and for which properly designed evaluations have been conducted that show it to be effective. These strategies may be employed with a good degree of confidence, but with the understanding that any application can lead to results that vary significantly from those found in previous evaluations. Crash reduction factors reported are typically based on valid research methods.

Tried: Those strategies that have been implemented in a number of locations and may even be accepted as standards or standard approaches, but for which there have not been found valid evaluations. These strategies, while frequently or even generally used, should be applied with caution; users should carefully consider the attributes cited in the guide and relate them to the specific conditions for which they are being considered. There can be some degree of assurance that implementation will not likely have a negative impact on safety and will very likely have a positive one. Crash reduction factors reported are not necessarily based on valid research methods and should be used with caution.

Experimental: Those strategies that have been suggested and that at least one agency has considered sufficiently promising to try on a small scale in at least one location. These strategies should be considered only after the others have been determined to be inappropriate or unfeasible. Even where they are considered, their implementation should initially occur using a very controlled and limited pilot study that includes a properly designed evaluation component.

Compatibility:
This section will make note of any compatibility issues with other strategies.

Supplemental Information:
This section will guide the reader to other information relevant to this strategy such as documents and Web sites.

For more information contact:

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U.S.Department of Transportation
Federal Highway Administration

Safe Roads for a Safer Future
Investment in roadway safety saves lives

Objectives and Strategies for Improving Safety at Unsignalized and Signalized Intersections

This key sheet and the accompanying intersection safety strategy guide sheets are companions to the NCHRP Report 500 series on strategies to reduce crashes at unsignalized (Volume 5) and signalized (Volume 12) intersections.

Objectives and Strategies for Improving Safety at Unsignalized Intersections

Objectives	Strategies	Time	Cost
A Improve management of access near unsignalized intersections	A1 Implement driveway closures/relocations A2 Implement driveway turn restrictions	●●○ ●○○	●●○○ ●○○○
B Reduce the frequency and severity of intersection conflicts through geometric design improvements	B1 Provide left-turn lanes at intersections B2 Provide longer left-turn lanes at intersections B3 Provide offset left-turn lanes at intersections B4 Provide bypass lanes on shoulders at T-intersections B5 Provide left-turn acceleration lanes at divided highway intersections B6 Provide right-turn lanes at intersections B7 Provide longer right-turn lanes at intersections B8 Provide offset right-turn lanes at intersections B9 Provide right-turn acceleration lanes at intersections B10 Provide full-width paved shoulders in intersection areas B11 Restrict or eliminate turning maneuvers by signing B12 Restrict or eliminate turning maneuvers by providing channelization or closing median openings B13 Close or relocate “high-risk” intersections B14 Convert four-legged intersections to two T-intersections B15 Convert offset T-intersections to four-legged intersections B16 Realign intersection approaches to reduce or eliminate intersection skew B17 Use indirect left-turn treatments to minimize conflicts at divided highway intersections B18 Improve pedestrian and bicycle facilities to reduce conflicts between motorists and nonmotorists	●●○ ●●○ ●●○ ●○○ ●●○ ●●○ ●●○ ●●○ ●●○ ●●○ ●○○ ●○○ ●●● ●●○ ●●○ ●●○ ●●○ ●●○	●●○○ ●●○○ ●●○○ ●○○○ ●●○○ ●●○○ ●●○○ ●●●○ ●●○○ ●●○○ ●○○○ ●○○○ ●●●● ●●●● ●●●● ●●●● ●●○○ ●●○○
C Improve sight distance at unsignalized intersections	C1 Clear sight triangles on stop- or yield-controlled approaches to intersections C2 Clear sight triangles in the medians of divided highways near intersections C3 Change horizontal and/or vertical alignment of approaches to provide more sight distance C4 Eliminate parking that restricts sight distance	●○○ ●○○ ●●● ●○○	●○○○ ●○○○ ●●●● ●○○○
D Improve availability of gaps in traffic and assist drivers in judging gap sizes at unsignalized intersections	D1 Provide an automated real-time system to inform drivers of the suitability of available gaps for making turning and crossing maneuvers D2 Provide innovative signs and markings to assist drivers in judging the suitability of available gaps for making turning and crossing maneuvers D3 Retime adjacent signals to create gaps at stop-controlled intersections	●●○ ●●○ ●○○	●●○○ ●○○○ ●○○○
E Improve driver awareness of intersections as viewed from the intersection approach	E1 Improve visibility of intersections by providing enhanced signing and delineation E2 Improve visibility of the intersection by providing lighting E3 Install splitter islands on the minor-road approach to an intersection E4 Provide a stop bar (or provide a wider stop bar) on minor-road approaches E5 Install larger regulatory and warning signs at intersections E6 Call attention to the intersection by installing rumble strips on intersection approaches E7 Provide dashed markings (extended left edgelines) for major-road continuity across the median opening at divided highway intersections E8 Provide supplementary stop signs mounted over the roadway E9 Provide pavement markings with supplementary messages, such as STOP AHEAD E10 Provide improved maintenance of stop signs E11 Install flashing beacons at stop-controlled intersections	●○○ ●●○ ●●○ ●○○ ●○○ ●○○ ●○○ ●○○ ●○○ ●○○ ●○○	●○○○ ●●●○ ●●○○ ●○○○ ●○○○ ●○○○ ●○○○ ●○○○ ●○○○ ●○○○ ●○○○
F Choose appropriate intersection traffic control to minimize crash frequency and severity	F1 Avoid signalizing through roads F2 Provide all-way stop-control at appropriate intersections F3 Provide roundabouts at appropriate locations	●●● ●○○ ●●●	●●●● ●○○○ ●●●●
G Improve driver compliance with traffic control devices and traffic laws at intersections	G1 Provide targeted enforcement to reduce stop sign violations G2 Provide targeted public information and education on safety problems at specific intersections	●○○ ●○○	●●○○ ●○○○
H Reduce operating speeds on specific intersection approaches	H1 Provide targeted speed enforcement H2 Provide traffic calming on intersection approaches through a combination of geometrics and traffic control devices H3 Post appropriate speed limit on intersection approaches	●○○ ●●○ ●○○	●●○○ ●●○○ ●○○○
I Guide motorists more effectively through complex intersections	I1 Provide turn path markings I2 Provide a double yellow centerline on the median opening of a divided highway at intersections I3 Provide lane assignment signing or marking at complex intersections	●○○ ●○○ ●○○	●○○○ ●○○○ ●○○○

Objectives and Strategies for Improving Safety at Signalized Intersections

Objectives	Strategies	Time	Cost
A Reduce frequency and severity of intersection conflicts through traffic control and operational improvements	A1 Employ multiphase signal operation A2 Optimize clearance intervals A3 Restrict or eliminate turning maneuvers (including right turns on red) A4 Employ signal coordination A5 Employ emergency vehicle preemption A6 Improve operation of pedestrian and bicycle facilities at signalized intersections A7 Remove unwarranted signal	●○○ ●○○ ●○○ ●●○ ●●○ ●○○ ●○○	●○○○ ●○○○ ●○○○ ●●○○ ●●○○ ●○○○ ●○○○
B Reduce frequency and severity of intersection conflicts through geometric improvements	B1 Provide/improve left-turn channelization B2 Provide/improve right-turn channelization B3 Improve geometry of pedestrian and bicycle facilities B4 Revise geometry of complex intersections B5 Construct special solutions	●●○ ●●○ ●○○ ●●● ●●●	●●○○ ●●○○ ●○○○ ●●●● ●●●●
C Improve sight distance at signalized intersections	C1 Clear sight triangles C2 Redesign intersection approaches	●○○ ●●●	●○○○ ●●●●
D Improve driver awareness of intersections and signal control	D1 Improve visibility of intersections on approach(es) D2 Improve visibility of signals and signs at intersections	●○○ ●○○	●○○○ ●○○○
E Improve driver compliance with traffic control devices	E1 Provide public information and education E2 Provide targeted conventional enforcement of traffic laws E3 Implement automated enforcement of red-light running (cameras) E4 Implement automated enforcement of approach speeds (cameras) E5 Control speed on approaches	●○○ ●○○ ●●○ ●●○ ●●○	●○○○ ●●○○ ●●○○ ●●○○ ●●○○
F Improve access management near signalized intersections	F1 Restrict access to properties using driveway closures or turn restrictions F2 Restrict cross-median access near intersections	●○○ ●○○	●○○○ ●○○○
G Improve safety through other infrastructure treatments.	G1 Improve drainage in intersection and on approaches G2 Provide skid resistance in intersection and on approaches G3 Coordinate closely spaced signals near at-grade railroad crossings G4 Relocate signal hardware out of clear zone G5 Restrict or eliminate parking on intersection approaches	●●○ ●●○ ●●○ ●○○ ●○○	●●○○ ●●○○ ●●○○ ●●○○ ●○○○